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ABSTRACT

The problem of disseminating scientific and humanistic knowledge to all segments of the population has thus far been explored in terms of socioeconomic and pedagogical impediments to science and liberal arts literacy. This paper seeks to recast this problem as a consequence of "book technology," and in particular explores how books and their service structures in bookstores, libraries, and universities work to segment and isolate knowledge from members of the population. In this context, the introduction of electronic text, with its capacity for instant transmissability across large distances, infinite duplicability, permanent storage, interactivity, modifiability, and "hypertext" instant cross-referencing, is scrutinized in three related environments for the new possibilities it holds for literacy: (1) word processing, (2) hypertext, and (3) hypermedia. (36 notes/references) (BBM)

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INTELLIGENT WRITING:

THE ELECTRONIC LIBERATION OF TEXT

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Contents: I-The Socratic Plaint II-Critiques of Literacy III-Early Electronic Facilitations of Print IV-Word Processing and the Mastery of Letters V-Hypertext and Hot Cognitive Buttons VI-Computer Conferencing and the Responsive Word VII-Economic Wherewithal of Text Liberation Notes

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INTELLIGENT WRITING: THE ELECTRONIC LIBERATION OF TEXT
by Paul Levinson (The New School for Social Research/Polytechnic Univ.)

Paper presented at Annual Meeting of
the American Association for the Advancement of Science,
San Francisco, January 16, 1989

> "I cannot help feeling, Phaedrus, that writing is unfortunately like painting; for the creations of the painter have the attitude of life, and yet if you ask them a question they preserve a solemn silence. And the same can be said of speeches. You would imagine that they had intelligence, but if you want to know anything and put a question to one of them, the 'speaker' gives one unvarying answer...
>
> "[But] may we not imagine another kind of writing or speaking far better than this is, and having far greater power?....
>
> "I am speaking of an intelligent writing which ... can defend itself, and knows when to speak and when to be silent."
>
> --Socrates, PHAEDRUS, 275-276

I: The Socratic Plaint

At first glance, Socrates' complaint and dream about writing seem trivial and foolish. That we know of this complaint and dream at all is due to Plato's having committed this to writing, and that the object of this complaint is what gives it life serves to continuously undermine the strength of the complaint.

And most of the fruits of what we hold to be civilization have surely been made possible by the dumb writing decried by Socrates. Even in Socrates' time, the introduction of the alphabet into Greek culture crystalized and furthered the great pioneering efforts in philosophy, logic, and science, just as earlier the Hebrews with the alphabet as their scepter had nurtured the monotheistic concept which soon would sweep much of the world. The alphabetized narrative may have given one unvarying answer indeed, but the scope of its canvas gave expression to anything and everything the human mind could imagine, and the distributability of this canvas across distance and time set the world on its course to the modern age [1].

That age -- our age -- was midwived into being by the introduction of the printing press into Europe more than 1500 years later. The printed text was no more responsive than the hand-written one, but it was easily duplicable, and thus made literacy the province of more than a handful of clergy and nobility. The printing press placed Bibles into everyone's hands, and thus made realizable Luther's dictum that people

should read the Bible for themselves. The result was the Protestant Reformation, and the loosening of the Age of Faith. At virtually the same time, printed descriptions of Columbus' voyages to the New World made these voyages real and fundable (far more so than the whispered myths of earlier Norse journeys), and the resultant Age of Discovery combined with the Reformation to stimulate the rise of national states. Meanwhile, the dissemination of scientific texts ignited and fanned the Scientific Revolution, which found fertile ground in the rise of national states and the Protestant Reformation. Capitalism too found fuel in printing, which made information about goods and services and discoveries and markets available everywhere. And this mutually reinforcing, multi-catalytic process was helped throughout by the growth of public education -- not only aided by the availability of textbooks, but brought into focus by the public's pressing need to learn how to read (what good are all the new books, if one cannot read them)[2]. This knowledge biosphere -- for knowledge indeed has many of the characteristics of living organisms and communities[3] -- continues to grow and bestow upon our planet such possibilities as to make any previous century, even decade, seem barren of knowledge in comparison.

Yet our enormous knowledge, and its embodiment in technological prowess that seems godlike in contrast to earlier generations, has not quite swept away the complaint and the dream of Socrates. We are still pitifully ignorant in terms of what we do not know, and the infinity of all possible knowledge means that we always will be. Further, the benefits of our knowledge, and the knowledge itself, are not equally available to all humans; many of us yet live in knowledge environments less rich than that enjoyed by Socrates. And so we ignore Socrates' complaint -- or construe literacy entirely in terms of words upon paper, and treat this as an unqualified, unimprovable benefit to our species -- at our peril.

II: Critiques of Literacy

Not everyone has ignored the Socratic objections to letters, or viewed literacy, traditionally construed, as something we simply need more of. Marshall McLuhan argued that the translation of experience into written text flattens or bleaches much of the original experience, and that the intellect is best served not solely by writing but by a variety of audio-visual media [4]. (Such critiques of writing build upon John Dewey's more general observation that experience is more primary than narrative, and ought to figure in a more direct and prominent way in both our philosophy and education [5].)

A more accessible and popular attack on past and current literacy as an undiluted "good" comes from Marxist quarters. The most impressive of these -- by Richard Ohmann, for example

[8] -- contends that from the very beginning writing was much more (and less) than a representation of knowledge; it was and still is a representation of the knowledge of elites, an embodiment of upper class agendas that at once excludes and distorts the ideas and agendas of lower classes. The classics of Greek literature were after all not written by slaves, Ohmann reminds us. And if the printing press shattered the monopoly of the Roman Catholic Church, it helped erect in its place new, more powerful monopolies of mercantile capital. In such a context, the exhortations of the past hundred years of a better life through literacy have a hollow ring, or worse, for the literate person becomes but a better receptacle for the propaganda of the dominating corporate and political strata. Here Ohmann puts a fine point on Jacques Ellul's now classic view that education and literacy make people more not less manipulable [7], and on the more general insistence of educators like Eleanor Burke Leacock that the problems of literacy are inextricable from those of racism and sexism [8].

Predictably, Ohmann is also highly critical of current calls for "computer literacy." Far from empowering a new generation of children and then adults, facility with computers will only make people more efficient cogs in the capitalist machine, Ohmann says. Sitting alone at one's personal computer provides the illusion not the substance of personal power, according to Ohmann, for the suppliers of the computers, the software, and the networks are the huge corporate powers over which the individual has no control.

Such critiques of computer literacy are an apt occasion for introduction of the central thesis of this paper: to wit, that possibilities for creation and revision of text via electronic word processing; the connections to ideas via hypertext (pre-programmed and user-programmable); the transmission and interactivity of text made possible via computer telecommunication networks; and the integration of text with sounds and pictures in the newest technologies; all provide circumstances for enhancement and empowerment of the human intellect that transcend or make irrelevant all of the above critiques of literacy.

This in turn suggests that critiques of literacy to date have been critiques not of literacy per se or in general, but of the peculiar literacy attendant to print on paper, or books. Certainly Socrates' objection to the dumb, unresponsive written word is an objection to the word on paper; in contrast, the "online" (computer network) environment provides continuing connections between readers and authors, and the written word here is thus at last a living expression of the author's soul -- "intelligent" in the sense longed for by Socrates. McLuhan's problem also finds some relief in the electronic environment, in which images and sounds can be integrated with letters much more

easily than on fixed paper. And, despite the corporate power and finance that animates the personal computer revolution, so too are the socio-economic concerns of Ohmann et al. mitigated and perhaps eventually eliminated in the electronic situation of text: for the book, like its older sibling the coin and its younger sibling the paper piece of money (all children of "press" technology), is discrete and ownable, a product inherently biased towards being kept to oneself and from others; whereas information in electronic form is nearly as leaky and transmissable and fecund as thought itself. Further, and even more importantly, the interactivity of letters imagined by Socrates and realized in online environments punctures the propagandistic cachet of text, which thrives in one-way media such as books and newspapers that allow only receipt and no questioning or challenging of information.

In this paper, then, I examine the electronic transformation of text, and the consequences of this transformation for literacy and society, in three related environments: word-processing, hypertext and hypermedia (the integration of text with images and sounds), and computer conferencing. We begin with a brief history of the early relationship of electricity to text and book culture.

III: Early Electronic Facilitations of Text

The pillars of the educational establishment whom Ohmann rightly criticizes as futile (or hollow, or worse) in their treatment of the problems of literacy are fond of blaming the distractions of audio-visual media, most recently television, for supposed declines or lack of progress in the growth of literacy [9]. Neil Postman, to cite but one example, argues that the habit of watching television quite literally scrambles our capacity for rational discourse, and with it our ability to read cogently [10]. The general impression given is that electronic media are sworn enemies of reason and reading.

Not only current personal computers and computer networks, but most of the history of electricity and communications, say quite the opposite.

Indeed, the very first use of electricity in communications, and in fact the first use of electricity in any industrial technology, was to transmit text via the telegraph. Although the placement of the end product on paper, the situation of the sending of the telegram outside of the home, and similar factors served to make the telegraph more a prophecy than a fulfillment of the electronic text revolution, the telegraph nonetheless achieved what would become the first principle of electronic letters: their transmissions at near instant speed across any distance. This capacity allows for immediacy, interactivity, a radical lowering of communication

costs, and the development of global information communities. Indeed, this globalization of intelligence was appreciated as early as 1851 by Nathaniel Hawthorne, who writes through his character Clifford in the House of the Seven Gables that the telegraph has transformed the world into "a great nerve, vibrating thousands of miles in a breathless point in time ... Rather, the round globe is a vast head, a brain, instinct with intelligence..."[11]

Electricity itself became a potent and more literal ally of literacy later in the 19th century, when electric lighting permitted people to read with equal ease anytime night or day. In the words of one historian, Edison's incandescent bulb "did more to improve the habit of reading than anything before it" [12]. Even allowing for somewhat larger contributions by the alphabet and the printing press, the advent of a safe and powerful source of reading light via electricity remains one of the most significant encouragements of the written word, removing forever the dependence of readers upon natural cycles of light, or dangerous forms of artificial light in candles, kerosene lamps, and gas fixtures.

And yet the inventions of the 19th century fell far short of providing a universal literacy, or a literacy free from the domination of economic interests underscored by Ohmann, Leacock, et al. The reason for this failure lies in what it was that electric lighting illuminated: still very much the piece of paper (as in the telegram), or more likely the newspaper, magazine, or book.

The equation of literacy totally with discrete collections of paper -- periodicals and books -- made literacy totally hostage to the economics not of the information conveyed on the pages, but of the costs of production and distribution of the physical pages themselves. In the year 1800, the average book cost about one week's wages for the average working person [13]. The streamlining of print technology, especially the development of linotype machines, throughout the 19th century resulted in great reductions of cost and thus price of books and periodicals. But as long as the cost of each copy of information entailed the cost of production and distribution of the paper and binding in which that information was embedded, the economics of literacy would remain entirely wrong, or out of kilter with the worth of information conveyed.

In such an environment, in which units of text are stored on the shelves of bookstores and libraries, to be doled out like so many precious gems or magic trinkets, the problems of literacy that yet confront us in our century, and threaten to do so in the next, are inevitable.

The remedy has been at hand for a century and a half -- in

the promise of the telegraph. It has been slow in coming for a variety of reasons, most importantly the human appetite for audio-visual imagery, the technological ease of receiving as opposed to producing and transmitting such images, and the resultant one-way mass media oligopolies in the United States and government controlled monopolies in most of the rest of the world [14]. But the remedy is indeed at hand: a start-up company in California will offer book length publications at approximately $5.00 per unit. How can this be? The key is that the books will be transmitted via personal computer, modem, and phone line [15].

Electronic text can originate either via electronic word processing, or in the electronic scanning of already printed pages. Even in the latter case, word processing plays a crucial role in the editing and preparation of text for electronic dissemination. We turn now to this first full-fledged expression of the digital liberation of writing.

IV: Word Processing and the Mastery of Letters

Educators have recognized for some time that writing, or the capacity to express one's ideas in a mode that is both lasting (unlike speech) and abstract (unlike more literal drawing and painting), can be a crucial component in the development of a critical reading facility. In the words of one recent report, children who are writers learn literacy from the "inside"[16].

To write is to become a producer in the reading process. Yet until the advent of word processing, this production was a technologically difficult and painful task -- i.e., the creation of text was difficult for reasons irrelevant to the agony and the ecstasy inherent in the expression of ideas and emotions in durable vessels. The source of this extraneous technological difficulty was that the very process that made the expression durable always made the expression immediately fixed and unyielding. Thus, whether carvings on walls or strokes with quills or impact of typewriter fonts, the human creation of text -- the impulse to write that is exceeded in priority in the communication history of our species by no media other than speech itself -- always resulted in a product that instantly had a formidable objective existence of its own. The consequence was that the initial creative process often became dwarfed in the subsequent negotiations that all writers were obliged to conduct with their products. "Is this change worth retyping the entire page" or equivalent question occupied a large share of every writer's mentality in the days, centuries, and millennia prior to word processing.

Word processing eliminates most of this negotiation, rendering the external text almost as malleable as the thoughts

it represents. For the first time in history, the writer's immediate product is externally reviewable and even aesthetically attractive, yet free of the commitment entailed when words are wedded to paper. (The easily erasable scribblings of a pencil are nearly as free of such commitment -- but their poor aesthetic and ephemeral qualities make them incapable of dissemination, and thus more akin to letters on the sand than any other form of writing.) Word processed text thus embodies Karl Popper's advice that we should not be committed or wed to our ideas, and instead must strive to expose them to continuing criticism and possibility of revision, discard, and transformation [17].

Word processing conveys a similar lesson to the reader, bringing even the most honored printed texts down from their pedestals and book shelves, to be revealed as expressions of ideas to be challenged and, where appropriate, changed. The carving of text in phosphor rather than stone deprives the text of much of the propagandistic aura identified by Ellul and Ohmann, for indeed (as at least Ellul recognized) the propagandistic punch was in the technology not the ideas contained within. And as we shall see in the next two sections, the placement of text in an electronic environment dramatically increases its likelihood of analysis and dissemination, which also work to reduce the dominating effects of print.

Not everyone in the philosophic community is happy about word processing (indeed, few philosophers have paid much attention one way or the other to its cognitive significance). Michael Heim appreciates some of the benefits, yet quotes Gore Vidal's observation that "the word processor is erasing literature," and worries that the ease of electronic text creation removes a distance, an enobling difficulty, between writer and text that may be essential for quality work [18]. Even more at odds with the central thesis of this paper is Heim's concern (and that of others he cites) that the easy transmissibility of electronic text will flood the world of letters with junk. My response -- presented in more detail in Section VI below -- is the evolutionary principle that diversity not restriction is the best source of quality, novelty, and change, and that the quality of the current "quality-controlled" environment via print is not very high in any case.

For now, I'm willing to admit that we have no empirical evidence one way or the other about the impact of word processing on creation and critical consumption of text[19]. We do, however, have the standing critiques of current and past treatments of the problem of literacy by Ohmann, Leacock, et al, as well as the fact that democracy has not fared as well in the age of print as writers in the Age of Reason may have hoped. And we have the additional intriguing possibility that glasnost and perestroika in the Soviet Union may in some way be connected

to the introduction of electronic text facilities there ...

What is clear about word processing, however, is that it intrinsically places text in a social context -- an environment in which other minds can quickly and totally become a part of the text (without precluding the original author's continuing work on the text). We now consider two ways that this social matrix brings to life the ancient plea of Socrates. We look first at the types of literacy possible when text is placed in a "hypertext" structure.

V: Hypertext and Hot Cognitive Buttons

From almost the day the first book rolled into mass readership courtesy of the printing press in Europe, publishers struggled to find ways of making its fixed, linear presentation of ideas more accessible to readers (earlier handwritten manuscripts were read by so few and with such leisure as to make expressways into the text unnecessary). Sidebar commentaries on the margins of texts (especially popular in the 19th century), footnotes at the bottom of pages, detailed tables of contents and indices several levels deep all are attempts to make linear print more simultaneous -- to bring it into greater consonance with the multiple, parallel processing of the human mind. In the case of a few authors like Nietzsche, Wittgenstein, and McLuhan, the text itself is presented in nonlinear "bursts" rather than chapters. Each section in such mosiacs contains a picture of the central theme of the work, taken from a slightly different perspective; the sections are thus "holographic" in that each part contains a blueprint of the whole [20].

Even the best indices, however, provide incomplete and distorted avenues of access. And the literary style of certainly Wittgenstein and McLuhan has in general not commended itself to readers brought up since childhood on the strictures of what Joyce termed the "a-b-c-d-edness" of linear text. Instant, simultaneous connections do not set well with words set down permanently on pages whose order cannot be changed.

The electronic presentation of text, in contrast, permits almost as many rapid and imaginative connections among ideas in print (phosphor) as the mind will allow. A typical hypertext situation would work as follows[21]: Let's say you are reading McLuhan's Understanding Media. You come upon his observation that television is a "cool" medium. With your cursor on the word "cool," you press a function key (or click a "mouse"), and before you scrolls every place else in the text where the word "cool" appears. Another click give you every place in the text where the concept of "coolness" is explained. A third displays all related discussion, and so forth. These pre-programmed connections can be made by the author, subsequent editors, or

both.

More sophisticated developments of hypertext (not yet fully available technologically) would allow connections to relevant ideas and concepts in other texts -- eventually to every surviving text ever written, all accessible on one universal, always-accessible data base (with many backup copies for safety's sake). Another useful realm of connections would be to audio, visual, and audio-video data-banks. When "clicking" on a word of text, the reader could call up relevant sounds and images, and vice versa when reviewing audio-visual presentations. (We could term this "hypermedia." [22] The new "NeXT" computer workstation is a major step in this direction [23].) A third strategy (and all of these are complementary) would allow readers to create their own permanent, semi-permanent, or fleeting hypertext connections.

This last capacity -- the electronic equivalent of notes scribbled in the margin, and highlighted and underlined text -- points again to the crucial issue of reader power over text. Rather than mutely accepting (or silently objecting to) the order of ideas presented by an author, or hypertext programmers, the reader could actively sculpt the text to his or her needs and interests. If word processing and the ease of electronic dissemination makes every writer a publisher, personal hypertext rearrangement of text composed by others makes every reader a writer. The individual is thus given yet another route of resistance to the propaganda of text -- a propaganda again undermined when deprived of its straight-jacket of print-on-paper presentation.

The reader is of course by no means invulnerable even in a hypertext environment, and hypertext connections are in any case only as good as the minds of the people who program them. As hypertext grows, a key and salutory issue will be: are the hyper-connections in keeping with the author's original ideas? In some cases, movement beyond what the author may have intended could be beneficial -- as long as the author's original text continued to be available for scrutiny. Another weakness of hypertext is that from the initial perspective of the reader the connections are all pre-programmed, and thus not fully interactive or "soulful" in the sense desired by Socrates.

The fulfillment of the Socratic dream for text comes in yet another expression of the electronic word environment: the transmission, storage, organization, and retrieval of text in computer conferencing networks, where authors can indeed be called upon to explain their words.

VI: Computer Conferencing and the Responsive Word

I am writing these words on January 8, 1989. Given the

current state of text technology, I can safely assume that most of you reading these words in the near future are reading them on some sort of paper -- initially photocopied paper, later perhaps in a journal or periodical, and a bit later perhaps as part of a book. Given the somewhat provocative theme of this essay, I also assume that many of you will disagree with or desire clarification of part or most of what you read here; certainly many of you will have questions. The great likelihood if you are reading these words on paper, however, is that I will know nothing of you or your questions. A few of you may publish articles, also on paper, that critique, further, attempt to refute, or otherwise engage the ideas of this essay. But the chances of you and I engaging in an ongoing intellectual dialogue about these themes are almost nil.

A few of you in the near future, more as we move into the next decade, may also be reading this in a hypertext environment, where I and/or editors have programmed connections among the ideas in this text. Eventually these connections may lead to ideas in outside texts; eventually every work cited in the Endnotes below will be readable on your screen with just the click of a button or equivalent. But each of you, my readers in the immediate and more distant futures, is unique, and again the likelihood that any number of pre-programmed hypertext connections can satisfy all of your questions in all of their subtleties and nuances is virtually nil. You may well use hypertext author features to tailor this text to your own interests and perspectives; this will be a more powerful form of readership for you, but will not be a dialogue with me.

The public debut of this paper will be on January 16, at the Annual Meeting of the American Association for the Advancement of Science. There photocopies of this paper will be available, and a small group of people will hear me deliver a talk similar to this paper at the San Francisco Hilton. At the conclusion of my brief talk, I look forward to responding to a few questions from the audience. I'll leave the room shortly before lunch, and later that day will fly down to San Diego. The tiny window for ongoing discussion of this paper will have closed.

Or will it? Are we no better off than the readers of Socrates/Plato's words, now and 2400 years ago?

We are. Because a few days before the AAAS presentation, I will post this paper on the Connected Education Campus of the Electronic Information Exchange System -- in short, on a computer conferencing network where I as author and several hundred potential readers have continuing access [24]. Via this online network, readers will be able to ask and I will be able to respond to all manner of questions about this essay.

Computer conferencing networks go back more than two decades, and thus predate hypertext and even word processing on personal computers. The key in every computer conferencing network -- whether constituted of primitive teletype and dumb terminals through the mid-1970s, or 32-bit personal computers of the late '80s more advanced in many ways than the central systems to which they connect -- is that authors can remain in literal contact with their words. The text online thus becomes both responsive and responsible, capable of the cross-examination and probing yearned for by Socrates so long ago.

In a typical computer conference, a long text such as this paper or a much shorter introductory "comment" or "memo" or "note" is transmitted from the author's personal computer via modem and telephone line to a central computer, where the text is stored and accessible to readers via their own personal computers and modem. Author and readers may take part in this conference from any place on the Earth with telephone connections; the central computer can be so contacted any time night or day. In a short period of time, readers become authors of the computer conferencing dialog, commenting on the initial author's comment, asking questions, developing ideas and themes. The initial author, in turn, thus becomes a reader of comments about the initial entry, and soon in the place of the rigid author/reader distinction of the paper world a new community of vibrantly blurred author-reader admixtures emerges [25].

Just as an individual hypertext program can in principle be connected to a global data-base of text, so the computer conferencing on any given network can be connected to others. Thus, I intend to post my paper on EIES; but I expect that within a few months my paper will appear electronically on other computer conferencing systems (with the proper permissions)[26]. Though all of this can be done with the speed of light, I likely will not be as responsive to questions on other networks as I will on my own (because to start with, I may not immediately know about them). Nonetheless, the possibility of world-wide online intellectual communities has already been realized [27].

However energizing the possibilities of a network, they of course can only be as worthwhile as the humans actually involved. Michael Heim and others worry that the very ease of electronic discussion of text will result in a profusion of dribble [28]. On the other side of the coin, a given author may elect not to respond to questions about a text. Or an author flooded with thousands of questions facilitated by electronic connections may be simply incapable on his or her own of responding [29]. As an ultimate limit, an author must be alive to participate in a computer conference.

These and related problems demonstrate that computer

conferencing is no panacea. Not every problem in human communication, not even in literacy, can be laid at the doorstep of the weighty tomes that fill libraries and bookstores in mute, unchanging witness to the original ideas of their authors and nothing more. But the asynchronous computer conference, and its supporting case in wordprocessing and hypertext, has at last put literacy in a new light. Never again will the written word be obliged to give one unvarying answer to all questions. Never again will the reader be obliged to silently mumble disagreements and criticisms, or accept text on a take-it-or-leave-it basis. Twentieth-century theorists from John Dewey to Jean Piaget have defined good education not as the passive receipt of previously digested wisdom injected hyperdermic-like into empty minds, but as the reaching out of active, powerful minds to confront and question and therein acquire and transform possible knowledge[30]. Text in electronic environments amenable to instant and universal access, infinite connection and reference, modifiability and interactivity, is an ideal vehicle for expression and development of such active minds.

About the only argument yet in favor of paper text is the current cost of even a hardcover book in comparison to the cost of minimum equipment necessary to take advantage of the electronic revolution. We consider this and related issues in our conclusion.

VII: The Economic Wherewithal for Text Liberation

As Anatole France might have said, what good is the liberation of text, if the vast majority of readers are liberated only to the fact that they cannot afford it? Electronic text media are no less hostages than print to the ravages of poverty and racism detailed by Leacock. Yet the structure of electronic technology, in particular its capacity for an infinite amount of text on a single screen (and great storage in CD-rom technology, which in a single disk can hold hundreds of book length texts), makes it much less vulnerable than print and its requirement of a separate piece of paper for each idea.

At first glance, electronic technology seems less attainable economically than books. After all, the least expensive personal computer costs far more than the most expensive book. Nonetheless, the personal computer is a one-time purchase. Like the television set, which has penetrated more than 99% of the homes in the United States[31], the personal computer when used for real tasks and education (not games) may prove to be a one-time expense virtually everyone can afford.

Further, the level of personal computer technology needed

to participate in the electronic treatment of text is not very advanced. Eight-bit personal computers obsolesced now by two generations of computers (16 and 32 bit machines) are more than adequate to handle the word-processing and telecommunication functions essential for computer conferencing (hypertext, however, is not easily possible on these older machines). The older machines can now be purchased for as little as several hundred dollars, and as the Reverend James T. Roberson (a leader in the introduction of personal computers and online networks to the black community) has aptly observed, the slower speeds of these older machines make them no less accurate or effective devices for use by less affluent people [32].

The widespread availability of low-cost, functional first generation MS-Dos and even earlier CP/M personal computers is only part of the reason the personal computer revolution is not just another high-tech corporate gambit to wring money from the middle and lower economic classes, as feared by Ohmann and others. From the very beginning, this revolution has been fueled by word processing and telecommunications software supplied free of charge or literally at cost (created by freelance programmers or "hackers," either placed in the public domain as "freeware," or distributed as "shareware" with a request for small payment [33]). The same can be expected with hypertext software. Indeed, the inherently effortless reproducibility of even commercial software, and the general failure of software sellers to protect their programs by "copy protection" programs [34], demonstrates -- contrary to Ohmann -- the inherently anti-monopolistic quality of information (as distinct from physical property such as books) in the marketplace. The plain facts of technology and life are that electronically encoded information is neither possessable nor exploitable in the manner of information inextricably wedded to paper or other physical containers [35].

Ironically, we've seen that when the new personal information technologies are not criticized for extension of corporate control (ala Ohmann), they are attacked for making too much information too readily available to everyone (ala Heim). Information overload, however, is an illusion that plagues only the information-wealthy, who may be unaware that new text technologies carry with them highly powerful devices for sorting and filtering of information [36]. Meanwhile the vast majority of people on this planet, who have long languished in chronic and destructive states of information underload, can do quite well without the patronizing concerns of those who have information that those who have not information are in danger of overload.

The electronic encoding of information, especially the computer chip, is sweeping away the veil of silence that has long smothered the written word and most of the world's

population. Let the Great Dialogue, the fulfillment of Socrates' vision, begin.

Notes

[1] On the relationship of alphabet and civilization, see any of the works of Harold Innis, Eric Havelock, or Marshall McLuhan, e.g., Innis, Empire and Communication (Toronto: Univ. of Toronto, 1950); Innis, The Bias of Communication (Toronto: Univ. of Toronto, 1951); Havelock, Preface to Plato (Cambridge, MA: Harvard Univ., 1963); Havelock, The Literate Revolution in Greece and its Cultural Consequences (Princeton: Princeton Univ., 1982); McLuhan, The Gutenberg Galaxy (New York: Mentor, 1962); and McLuhan, Understanding Media (New York: Mentor, 1964). See also Paul Levinson, Mind at Large: Knowing in the Technological Age (Greenwich, CT: JAI, 1988), pp. 119-135; and "Human Replay: A Theory of the Evolution of Media," Ph.D. diss., New York University, 1979, pp. 171-176, 245-273.

[2] See Mind at Large, pp. 128-135 for more on the printing press' ignition of the mutually escalating Protestant Reformation, Scientific Revolution, rise of national states, capitalism, and public education. See also the works of Innis and McLuhan cited in Note [1] above, and Elizabeth Eisenstein, The Printing Press as an Agent of Change (New York: Cambridge Univ., 1979).

[3] See Donald T. Campbell, "Evolutionary Epistemology" in P. A. Schilpp, ed. The Philosophy of Karl Popper (LaSalle, IL: Open Court, 1974), pp. 413-463; Karl R. Popper, Objective Knowledge, 2nd ed. (New York: Oxford, 1979); my Mind at Large; and the extensive bibliographies in these works for more on the analogies and equations between the growth of knowledge and living organisms.

[4] See, for example, Gerald E. Stearn's interview with McLuhan in Stearn, ed., McLuhan: Hot and Cool (New York: Dial, 1967), pp. 266-302.

[5] E.g., John Dewey, Experience and Nature (Chicago: Open Court, 1925).

[6] E.g., Richard Ohmann, "Literacy, Technology, and Monopoly," College English 47, 7 (November 1985), pp. 657-689; see also the works cited at the end of Ohmann's article.

[7] Jacques Ellul, Propaganda (New York: Vintage, 1962/1965), p. 106.

[8] Leacock's classic edited volumes in these areas are The Culture of Poverty (New York: Simon and Schuster, 1971) and Myths of Male Dominance (New York: Monthly Review, 1981). See

also her Teaching and Learning in the City Schools (New York: Basic, 1969), a study of racism and education in New York City.

Leacock and her colleagues at the Polytechnic Institute of Brooklyn (now the Polytechnic University of New York) developed a series of social science readers in the 1960s, designed to introduce what we would today call "technologically literate" students to literacy in the liberal arts areas of history, philosophy, social and literary criticism, and the like. In her Introduction to Volume V of this series (the series is entitled "Social Science Theory and Method: An Integrated Historical Introduction"; the volume is entitled "The Emergence of Social Science"; the volume is edited by Louis Menashe, Leacock, and Helmut Gruber), Leacock makes the following observation about written versus oral modes of criticism -- an observation very much in keeping with Socrates' complaint, and the critique of "book" text I offer in this paper:

"One might question, however, whether books and writings not considered worthy by a ruler of the time would be preserved, and would justify a scribe's support. Although great wisdom is shown in the writings of ancient civilizations, they are not directly critical or analytical... Probably the critical attitude was carried in the oral tradition of popular poems and tales" [p. 2].

The thrust of the present paper is that electronic text "re-oralizes" the critical attitude often suppressed by words on paper.

(Leacock herself did not consider the impact of personal computers upon the problems of literacy. I thank Louis Menashe of Polytechnic University for making the unpublished "Social Science Theory" volumes available to me, and Michael Vozick at the City College of New York for discussion of Leacock's later work at the City University.)

[9] See William McKeever, "The Motion Picture: A Primary School for Criminals," Good Housekeeping (August 1910), pp. 184-186, for an early salvo against motion pictures; and Flora Schreiber, "The Battle Against Print," The Freeman, 20 April 1953, for an initiating shot against television. (McKeever is critical not only of motion pictures but of inexpensive "dime novels" as destructive of what he views as quality literacy.) David Sohn's interview with Jerzy Kozinski, "A Nation of Videots" (1975), reprinted in H. Newcombe, ed. Television: The Critical Eye, 3rd ed. (New York: Oxford, 1982), pp. 351-366; Jerry Mander, Four Arguments for the Elimination of Television (New York: Morrow, 1978); and Neil Postman's works [see Note 10 below] are examples of the continuing hue and cry about television's destruction of literacy. See Mind at Large, pp. 143-144, 160 for my critique of these critiques.

[10] E.g, Postman, Teaching as a Conserving Activity (New York: Delacorte, 1979); The Disappearance of Childhood (New York: Delacorte, 1982); Amusing Ourselves to Death (New York: Viking, 1985).

[11] House of the Seven Gables (1851) (New York: Collier, 1962), p. 239. (Cited by Lewis Mumford, The Pentagon of Power [New York: Harcourt Brace Jovanovich, 1970], p. 314 as a 19th century recognition of the totalitarian effects of telecommunication.)

[12] David de Haan, Antique Household Gadgets and Appliances (Woodbury, NY: Barron's, 1977), p. 121.

[13] Edward Jay Whetmore, Mediamerica, 4th ed. (Belmont, CA: Wadsworth, 1988), p. 22.

[14] See Mind at Large, pp.142-144.

[15] See Carol Olsen Day, "A Novel Idea," PC/Computing, January 1989, pp. 235-236, 238 for a description of Neil Schulman's new Softserve Publishing Company.

[16] NBC-TV Nightly News, January 4, 1989, 7:20 PM (EST).

In my unpublished notes on overload in the electronic environment, I argue that production or contribution of information is an excellent way to combat the sensation of being overwhelmed as a consumer of information. See also the next to last paragraph of the present paper.

[17] See, for example, Popper's Objective Knowledge.

Of course, criticism itself -- and the revisions made easy by word processed text -- may be in error. As long as our ideas and their expression in text remain revisable, however, this poses no problem.

[18] Heim, Electric Language: A Philosophical Study of Word Processing (New Haven: Yale Univ., 1987). (Vidal quote is on p. 1.)

[19] See, however, Jim Dunn, "Page vs. Screen: A Comparison of Reading Modalities," MA thesis, The New School for Social Research, May 1988, for a preliminary experiment that shows advantages in comprehension for screen readers. (Abstract to be published in T. Kaye and R. Mason, eds. Mind Weave: The Use of Computer-Mediated-Communication in Distance Education [London: Pergamon, 1989], forthcoming.)

[20] See Paul Levinson, "Marshall McLuhan and Computer

Conferencing," IEEE Transactions on Professional Communication, PC-29, 1 (March 1986), pp. 9-11 for my analysis of McLuhan's "electronic" text style (developed prior to the invention of personal computers). See also William Kuhns, "Marshall McLuhan and Hypertext" (draft essay, 1 July 1988).

[21] See T. F. Chiang, "Hypertext: Linking Related Documents," Profiles, June 1988, pp. 18-23 for a summary of the history, current development, and future possibilities for hypertext. Ted Nelson's "Xanadu" project, begun in 1967 and now attempting to construct a global hypertext data-base, is the acknowledged parent of this field.

[22] See Paul Levinson, "Media Relations: Integrating Computer Telecommunications with Educational Media" in T. Kaye and R. Masons, eds. (forthcoming) for analysis of the co-mingling of text and audio-visual media.

[23] See John Schwartz, Michael Rogers, and Richard Sandza, "Steve Jobs Comes Back," Newsweek, 24 October 1988, pp. 46-51.

[24] I'm President of Connected Education, Inc., a not-for-profit corporation that offers courses entirely via computer conferencing for graduate and undergraduate credit in conjunction with The New School for Social Research (an entire Masters of Arts degree with a thesis requirement can be earned via this online program). Connected Education's "electronic campus" -- where the courses are conducted, and consisting also of an online library with hundreds of papers, and other scholarly and social features -- is situated on the New Jersey Institute of Technology Electronic Information Exchange System (EIES).

For details on the development of EIES and computer conferencing systems in the 1970s, see Roxanne Hiltz and Murray Turoff, The Network Nation (Reading, MA: Addison-Wesley, 1978). For descriptions of the Connect Ed Program, see Paul Levinson, "Connected Education: The First Two Years," Learning Tomorrow (Winter 1988), pp. 205-220; "Connected Education and the International Community," International Information Access (November-December 1986), pp. 1-2; and Mind at Large, chapter 8.

See also Brian Smith, "The Electronic University," New Jersey Monthly, January 1987, pp. 38 ff.; Brock Meeks, "The Quiet Revolution," BYTE, February 1987, pp. 183 ff.; Gail Thomas, "Electronic Campus a Reality with Computer Conferencing," Bulletin of the American Society for Information Science (April-May 1988), p. 23; and Thomas B. Allen, "Bulletin Boards of the 21st Century Are Coming of Age," The Smithsonian, September 1988, pp. 83-93.

[25] Andrew Feenberg, a pioneer in online education,

describes a computer conference as a magazine in which the readers all have the option of becoming authors; see my "Marshall McLuhan and Computer Conferencing" for details. See also Harvey Wheeler, The Virtual Society (Los Angeles: Martha Boaz Foundation, 1987 [computer disk]), for a far-reaching analysis of the way electronic text constructively blurs many traditional scholarly boundaries, including those between library and university and publisher (an electronically published text can be the identical constituent of all three activities); see also my review of Wheeler's book in The Journal of Social and Biological Structures (forthcoming).

[26] The ease of electronic dissemination of information can create serious problems for copyright and respect of intellectual property. See Herman Cohen Jehoram, "From Copyright Law to Information Law," Journal of the Copyright Society of the USA, 34, 4 (July 1987), pp. 380-388, and the works cited there, for a summary of the significant issues. As John Bing, cited in Jehoram's article, puts it:

"The computer has set information free. Traditionally, information has been chained in words to a page. Modern technology -- especially computer-based technology -- has liberated the words from the medium. A text or a set of characters is more appropriately viewed as something separate, rather than a property of a page, a book, a stone slab, or a film strip ... When liberated from the medium, legislative technique comes up against severe problems" [from Bing, "Information Law?," Journal of Media Law and Practice, 2, 3 [December 1981], p. 219].

The position of both Connected Education and EIES is that the author's copyright privileges must be at all costs respected.

[27] Individuals who have accounts on more than one system effectively bring world-wide networks into being constantly by "porting" or copying materials to and from networks. For example, after posting this paper on EIES, I will likely also post it on Notepad; and people with accounts on both EIES and other systems (for example, the Open University's COSY system in the United Kingdom) can likewise post my paper on these other systems (after receipt of proper permissions).

At least two more formally connected global computer messaging networks also have come into existence in the past few years: the "Bitnet" system, which links together university computers all over the world, and "Dasnet," which for a small fee transfers text across systems. These can be expected to grow.

See Chapter 8 in Mind at Large for more on "Technology and the Globalization of Intellectual Circles."

[28] See Heim, p. 210 ff., and the sources cited there. "There is an inflation of text through word processing," Heim begins (p. 210). Then, "computer mediated communication creates a psychological framework in which more text will become easily available but the text will probably be less intelligent, less carefully formulated, less thoughtful text. Computers may boost productivity, according to this criticism, only to have a greater production of written stupidity" (p. 219). Heim offers no objection to this criticism, then adds, "In such an atmosphere, the normal safeguards provided by traditional publishing will be rendered inoperative ... the authorial voice will deteriorate as a model of mental integrity" (212-220).

While not agreeing completely with Ohmann's perspective that "traditional" publishing standards reflect nothing but the dictates of monopoly capital, I certainly in view of the low quality of much published text can shed few tears about the destruction of such "safeguards" by electronically empowered hands.

[29] The British Open University's use of computer conferencing to help in the education of as many as 1200 students in one course offers a practical forum for study of the infinite response problem. The OU's tutor system -- already in place prior to its recent introduction of computer conferencing -- deals with this problem by assigning tutors to groups of 15 or fewer students. See many of the essays in T. Kaye and R. Mason, eds. (forthcoming), especially Ray Thomas, "The Role of Computer Mediated Communication in Open University Teaching," for discussion of computer conferencing at the Open University.

In April-May of 1985 I gave a public electronic text lecture ("Electure") on The Source (a commercial network) entitled "Space: Humanizing the Universe." More than 400 participants entered more than 800 comments; fortunately, many of the participants responded to each others' comments, thereby lifting some of this responsibility from me, and allowing me to adopt more of a summarizing role. The principle apparently is that in large numbers of computer conferencers, natural leaders emerge.

[30] See Henry Perkinson, "Education and Learning from Our Mistakes" in P. Levinson, ed. In Pursuit of Truth: Essays on the Philosophy of Karl Popper (Atlantic Highlands, NJ: Humanities, 1982), pp. 126-153 for a summary and analysis of Piaget, Montessori, and other "activist" educational theorists.

[31] Figures cited by Jonathan Miller, "The Global Picture," Channels 1986 Field Guide (1985), p. 16.

[32] James T. Roberson, "The Black Church and Technology" (unpublished manuscript, 1988) (available online via the

Connected Education Library, EIES).

[33] See Alfred Glossbrenner, How to Get Free Software (New York: St. Martin's, 1984).

[34] See Stewart Brand, ed. Whole Earth Software Catalog for 1986 (Garden City, NY: Doubleday, 1985), p. 5 for a concise explanation of why copy protection schemes failed: purchasers (legitimate owners of the software) resented this restriction on their right to copy the software for their own use.

[35] Xerox photocopying is in effect the first expression of this divorce of text from paper, in that photocopying separates text from dependence upon the piece of paper on which it happens first to be situated. Cf McLuhan's observation that the "xerox makes everyone a publisher," "The Laws of the Media," with a Preface by Paul Levinson, et cetera, 34 (2) (June 1977), pp. 173-179.

[36] Traditional libraries and bookstores are much likely sources of overload, since the person who enters these physical places is usually obliged to see all or most possible selections spread before one's eyes at once; however, few people feel overload in such settings, because we have learned since childhood (if we have any experience at all with libraries or bookstores) to deal with information step by step (i.e., to browse). Similarly structures allow perusers of online text to similarly browse, and quickly reduce overload feelings once they are learned. See also Note 16 above.